

precautions having been taken than at Corona, Colo., during the eclipse of June 8, 1918, where they were observed.

The eclipse of May 29 as observed at Cape Palmas, was not nearly as dark, in spite of its long duration, as the much shorter one of June 8, 1918, at Corona. There was a marked difference in light, both as seen visually and as shown by the photographs, between the inner corona and the outer extension. The large red prominence was a startling object.

Clear indications were had with regard to a magnetic effect in accordance with the results obtained at previous solar eclipses.

There was a steady slight decrease in temperature from 12^h G.M.T., 0.7 minute after the first contact, to 12.7^h G.M.T., and then a more rapid decrease until 14^h G.M.T., when the minimum temperature of 79.4° F was reached. This time (14^h) was approximately 0.4^h later than the middle time of totality. The increase in temperature after 14^h was rapid, the maximum 82.7° F being reached at 14.9^h G.M.T. The hygrogram for May 29 showed the following effect: The humidity, which was 71 per cent at 12^h G.M.T. steadily increased to 78 per cent at 14^h G.M.T. There was a more rapid decrease from 14^h G.M.T. to 15^h G.M.T., when the humidity was 66 per cent. The maximum humidity, therefore, occurred at 14^h, or approximately 0.4 hour later than the middle time of totality. The barogram showed nothing marked during the time of the eclipse.

VELOCITY OF THE WIND IN HIGH ALTITUDES IN CLEAR WEATHER.

By CH. MAURAIN.

[Abstracted from *Comptes Rendus*, July 15, 1919, pp. 79-82.]

In order to determine the average speed of the wind in extreme altitudes, as many records of sounding balloons as possible were assembled, and of these all those were taken which attained altitudes greater than 10 kilometers. From 198 such flights it was found that the mean speed of the wind increased in an almost linear manner from 5 meters per second at an altitude of 500 meters, to 15.6 meters per second at 11,000 meters, after which it began to decrease until it reached in the neighborhood of 8 meters per second at 19,000 meters. Of these flights, there were 11 in which a speed greater than 40 meters per second was observed, 2 in which it exceeded 50 meters per second, and one which gave a value of 55 meters per second. The last was observed at Pavie.—*C. L. M.*

THE MONSOONS OF TUNIS.

By J. ROUCH.

[Abstracted from *Annales de Géographie*, vol. 28, No. 153, pp. 226-229, 1919.]

The monsoon, the most important effect of the unequal heating of the continents and the oceans, is, except in a very few regions of the world, masked by the general circulation. The presence of this effect can, however, be clearly demonstrated by a method due to Allard and Angot:

The mean wind observed in any season is considered as resolvable into two components—the mean annual wind and a seasonal (monsoon) wind. From the triangle of velocities it is evident that the seasonal wind (monsoon component) is given by the diagonal of the parallelogram constructed on the mean annual wind and the mean wind observed in the given season.

Upon constructing the seasonal (monsoon) components by this method, and expressing each in terms of the mean annual wind, for six selected stations in Tunis, it is found that there is a strong winter monsoon component normal to the coast line, and directed toward the sea, for all coast stations, and that there is an equal monsoon component, oppositely directed, in summer.

At the inland stations, however, the effect is scarcely noticeable. At 200 kilometers from the coast the seasonal (monsoon) components are practically nil. Since isobaric charts show that the relative distribution of pressure over the eastern Mediterranean and southern Tunis is reversed between the two seasons, this fact can not be explained if it is assumed that the differences of pressure are alone responsible for the winds. Probably the temperature gradient, which is steep near the coast, must also be considered.

It is known that at some altitude the direction of the monsoon wind should be opposite to that of the surface. The aerological observations at Bizerte and at Sousse, Tunis, are expected to furnish information as to this altitude variation.—*E. W. W.*

ATMOSPHERIC WATER.

By OSCAR E. MEINZER.

[Abstracted from "Outline and Glossary of Ground-water Hydrology," an unpublished U. S. Geol. Surv. manuscript, pp. 1-7.]

The term "water" is used in geophysics to denote hydrogen monoxide, or chemically pure water, together with the solid, liquid, and gaseous materials held by the hydrogen monoxide as it exists in the earth in its natural condition."

The water of the earth may be divided into three parts—(1) Atmospheric water, the solid, liquid, and gaseous water which exists in the atmosphere; (2) surface water, the solid, and liquid water which exists on the upper surface of the lithosphere, i. e., in the hydrosphere; (3) subsurface water, the solid, liquid, and gaseous water which exists below the surface of the lithosphere. Water is often discharged from the atmosphere into the lithosphere, and vice versa, but, the capacities of these being limited, the hydrosphere becomes the receptacle for all water which the other "spheres" do not hold. Furthermore, the water-holding capacity of the atmosphere space alone changes rapidly and greatly, and the different parts of the atmosphere alternately receive water from, and yield water to, the hydrosphere and the lithosphere. The frequent changes in the water capacity of the atmospheric space are the principal cause of the continuous movement of water in the hydrosphere and lithosphere, and the principal agency that prevents the attainment of static equilibrium in the water of the earth.

Atmospheric water in the gaseous state is known as atmospheric water vapor. The solid and liquid water of the hydrosphere and lithosphere, and also any solid and liquid water which may exist in the atmosphere, are the sources of atmospheric water vapor; the process of conversion being known as evaporation, or vaporization. The term "evaporation" is also used to designate the quantity of water that is evaporated. When thus used it is generally expressed as depth of liquid water removed from a specified surface, most commonly in inches or centimeters. The rate of evaporation is expressed in units of depth per unit of time. The evap-

orativity or the potential rate of evaporation of a given part of the atmosphere is the rate of evaporation under the existing atmospheric conditions from a surface of water which is chemically pure and has the temperature of the atmosphere. It is expressed in depth of water (measured in liquid water) removed from the surface in a unit of time. Observations that give continuous records of evaporativity, some of them covering several years, are made at various localities by the U. S. Weather Bureau and by other agencies, by means of special apparatus and methods. The evaporation opportunity* afforded by a land surface or a surface of the hydrosphere in contact with the atmosphere is the ratio of the actual rate of evaporation from that surface to the evaporativity under existing atmospheric conditions. This ratio is generally stated as a percentage, and may be calculated by the formula

$$\text{Relative evaporation} = 100 \frac{e}{E}$$

where e is the actual rate of evaporation, in any convenient units, and E is the evaporativity in the same units. Generally, surfaces other than pure water surfaces have evaporation opportunities of less than 100 per cent, but under exceptional conditions of luxuriant vegetation the evaporation opportunity [relative evaporation] may be more than 100 per cent. The condition of any given part of the atmosphere with respect to its content of water vapor is known as the humidity.¹

Solid and liquid water in the atmosphere may be derived mechanically from the hydrosphere, as through the action of wind in the cases of spray, drifting snow, etc., but it is largely derived through the process of condensation from the already existing atmospheric water vapor. Through the subsequent event of precipitation, atmospheric water becomes surface and subsurface water. Precipitation may be due to the falling of solid or liquid particles which have become too heavy to remain in suspension, or it may be due to the condensation, at the surface, of the earth of atmospheric water vapor, as in the cases of dew and frost. We thus have the following:

Classification of atmospheric water.

A. Water in gaseous state (Atmospheric water vapor); derived by evaporation.

B. Water in liquid or solid state:

1. Derived mechanically through the agency of wind: Spray, drifting snow, etc.

2. Derived by condensation:

a. In small particles * * *. 1. At some distance above the surface of the land or the hydrosphere: [Some cloud [S]]. 2. At or near the surface of the land or the hydrosphere: Fog.

b. In larger particles * * *. Rain, snow, hail, sleet.—E. W. W.

* "Relative evaporation" would be, perhaps, more expressive of what this term means, and it would be more or less analogous to relative humidity. The fact that relative evaporation is already in use to express the relative losses from evaporation pans of different sizes exposed in the same atmospheric environment, should not necessarily preclude such a new application of this term. We do not speak of the "relative rainfall" when comparing the catches of adjacent rain-gages, but refer to differences in catch. In the same way, the instrumental differences in the indications of adjacent evaporimeters should be referred to as differences in water loss, or, perhaps, to retain the present designation, relative evaporation loss.—C. F. B.

¹ A space is said to be saturated with water vapor, if the quantity of water vapor it contains is the maximum which it can hold at the existing temperature; in the absence of dust particles or other nuclei which promote condensation, a state of supersaturation may exist, however. It is to be emphasized that the capacity of a given part of the atmosphere for water vapor is nearly the same as that of a like empty space, being modified only slightly by the presence of the other constituents of the air. (Author's footnote.)

SOME EXAMPLES OF THE "COMPRESSION OF A CYCLONE."

By G. GUILBERT.

[Reprinted from Science Abstracts, Sect. A, Aug. 30, 1919, §998.]

The author gives concrete cases of the application of one of his general rules for weather forecasting which is as follows: Every depression which is surrounded on all sides by "convergent" winds of which the velocities are abnormal by excess, will fill up *in situ* within 24 hours—sometimes within 12 hours—with high pressure in the middle of the former depression.—R. C.

ON THE ERRORS WHICH CAN RESULT FROM AN INCOMPLETE KNOWLEDGE OF AEROLOGICAL CONDITIONS.

By L. DUNOYER.

[Reprinted from Science Abstracts, Sect. A, Sept. 30, 1919, §1158.]

On a long flight such as that across the Atlantic variations of wind may produce considerable deviations from the intended course unless they are correctly allowed for. To obtain numerical results two cases are considered: (1) That of a cross wind of constant direction the strength of which follows a sine-curve variation, the breadth of the current from one place of zero velocity to the next; or half period, being equal to the length of the flight; and (2) the case where the velocity remains constant but the direction of the wind varies uniformly along the course. For each of these cases the deviation, or lateral error, in making the point aimed at is calculated on the assumption that (a) no allowance is made for drift, and (b) that allowance is made throughout for a constant wind equal to that prevailing at the start. Taking a speed of flight of 150 km./hour and a maximum wind velocity of 25 m./sec. the deviation at the end of the course may attain to four-tenths of the length of the route if no correction for wind is made (case a) or to eight-tenths if the starting wind is corrected for throughout (case b). The errors may thus be very important.—J. S. Di[nes].

ATMOSPHERIC CONDITIONS WHICH AFFECT HEALTH.

By L. HILL.

[Reprinted from Science Abstracts, Sect. A, Sept. 30, 1919, §1159.]

The discomfort felt in crowded rooms is due to the low cooling and evaporating power of the air, not to its chemical impurities. To measure the cooling power from surfaces at body temperature the Kata-thermometer has been devised. The instrument is here described and the equations connecting its readings with the different meteorological elements (temperature, wind velocity, humidity, etc.) are set out. In an appendix the mean meteorological conditions are given for different stations and the cooling power is calculated. The cooling power in Madras in the shade and fully exposed to the wind during the worst months is found to be the same as that met with in shut-up rooms and factories in this country. Diagrams are given to prove how different the cooling power as shown by the Kata may be under different circumstances where ordinary thermometric readings show little difference. The hope is expressed that cooling power at body temperature may be measured as part of the regular procedure at meteorological stations. It is also hoped that vapor pressure rather than, or in addition to, relative humidity may be recorded, as being of more service for determining the cooling of damp surfaces at body temperature.—J. S. Di[nes].